

Atty. Ref.:SJ0000019US2 (60717-300502)

Page 4 of 8

RECEIVED  
CENTRAL FAX CENTER

MAR 09 2007

**Remarks/Arguments:**

Applicant wishes to thank the Examiner for her detailed comments. As Examiner has chosen to group her comments by section, Applicant shall address each of these sections and points in turn.

***Claim Rejections - 35 USC § 103***

Examiner has stated:

"Suenaga et al. discloses using a laser beam for forming a slider. The laser beam is scanned (reflected) by the polygon mirror. The laser pulse width is approximately 10 nsec to 1  $\mu$ sec. A beam expander composed of convex lenses and contracted and shaped by a slit magnifies the laser beam. The slider is brought into coincidence with the focusing plane of the optical system. Q-switching is used on the laser. The rotating polygon mirror is a directing device.

"Suenaga et al. does not teach repetition, energy per pulse, fluence or the presence of a stage.

"Chiba et al. discloses laser marking of a silicon semiconductor material. The pulse width of the laser beam is 10 to 700 ns. Marks (spots or dots) may have a protrusion shape, an indentation shape or a combination of both. The average mark depth is 0.01 to 5  $\mu$ m. care is taken during processing to negate deformation (cracking) from occurring. The laser beam may be produced by an YVO<sub>4</sub> laser with wavelengths from 300 to 1064 nm (thus encompassing the green range). Diameters are in the range of 1.5 to 6.5 times larger than the dot diameter of 7.2 to 30  $\mu$ m (i.e. 10.8 to 195  $\mu$ m). Speed and marking is such that the dots are equivalent spaced as shown in figure 3. Table 1 gives the dot diameter and the energy density, which yield an energy pulse in the range of 0.87 to 9.3 micro joules. Repetition of 1 kHz or less.

"Kerth et al. ('775) discloses the making of a high definition, high aspect ratio slider using laser etching. The laser pulse duration is 16 ns and the fluence is substantially 600 mj/cm<sup>2</sup>. Figure 3 shows the slider workpiece (68) mounted on a holder (78).

"It would have been obvious to one of ordinary skill in the art at the time of the invention to use the repetition, the energy per pulse, the fluence and use a holder (stage) as taught by Chiba et al. and Kerth et al. ('775) in the Suenaga et al. system because these are merely functional components of a laser etching system."

Independent Claim 20, as currently amended requires:

"a laser which produces a pulsed laser beam for machining the slider material, the laser beam having a pulse width in the range of  $1 \times 10^{-9}$  seconds to  $1 \times 10^{-3}$  seconds, with an energy per pulse in the range of 10 to 1,000,000 microJoules, and a repetition rate between 1Hz and 400Hz;"

W:\Hitachi-60717\300502 Apparatus for Curvature Modification\RFOA App for Laser Curvature.doc

Atty. Ref.:SJ0000019US2 (60717-300502)

Page 5 of 8

The cited Chiba reference discloses an energy pulse in the range of "0.87 to 9.3 micro joules" as cited by the Examiner above. The currently amended range of 10- 1,000,000 micro joules falls outside of the range of the cited reference.

5 The present inventors have found that the production of very precisely controllable crown in slider material is possible by treatment of the flex side of the slider, when a pulsed laser beam having a combination of several specific parameters is used. These parameters of energy, repetition and pulse width are specifically designed for the purpose of producing very high crown and camber in  
10 slider materials by creating controlled tensile stress in the flex side of the sliders using variable laser fluence to melt the slider material without over-heating the sensor in it and without tensile stress relief cracks of controlled or preferred orientation.

These sensors are very delicate mechanisms and can be easily damaged by  
15 the inappropriate application of laser energy. It required considerable experimentation to design the apparatus to produce appropriate fluence as determined by these energy pulse parameters, and one skilled in the art could not easily produce such an apparatus without much experimentation. The apparatus claimed is carefully configured to produce this combination of parameters for this  
20 specialized application. Thus the present invention cannot be fairly said to be obvious in view of the cited prior art.

In addition, it cannot be fairly said that the present invention is obvious in view of the cited prior art because the prior art does not address the same problem addressed by the current invention. In order to have a proper motivation to  
25 combine the cited references, there must be some appreciation of the problem, which is not demonstrated in the cited prior art.

W:\Hitachi-60717\300502 Apparatus for Curvature Modification\RFOA App for Laser Curvature.doc

Atty. Ref.:SJ0000019US2 (60717-300502)

Page 6 of 8

Thus it cannot be fairly said that the present invention is made obvious by the cited references, either alone or in combination.

Therefore, Applicant respectfully asserts that the present invention is not obvious in view of the cited references. Applicant respectfully requests that the rejection be withdrawn and Claim 20 be allowed, and dependent claims 21-29 be allowed.

Examiner has stated:

10 "Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suenaga et al., Chiba et al. and Kerth et al. ('775), as stated in the above and further in view of Rieger et al. (USPN 5,790,574).

"Suenaga et al., Chiba et al. and Kerth et al. ('775) do not teach a harmonic.

15 "Rieger et al. discloses a laser which used for ablation and etching. The average power range is 1 kW. The laser is Q-switched and the system generates about 150 Ps at a frequency of 1 kHz. The energy per pulse is 0.6  $\mu$ J. In addition a second harmonic generator may be used. The system also has a steering mirror, a beam expander, and highly reflective mirrors.

20 "It would have been obvious to one of ordinary skill in the art at the time of the invention to use a harmonic, determine the energy per pulse and the repetition, as taught by Rieger et al. in the Suenaga et al., Chiba et al. and Keith et al. ('775) system because these are merely standard parameters used in a laser ablation system."

Claim 25 is dependent on Claim 20, and includes by it dependence the assertedly non-obvious features of the present invention. Therefore, Applicant respectfully asserts that this claim is also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claim 25 be allowed.

30 Examiner has stated:

"Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suenaga et al., Chiba et al. and Kerth et al. ('775), as stated in the above and further in view of Kerth et al. (USPN 5,739,048).

35 "Suenaga et al. and Kerth et al. ('775) do not teach producing multiple sliders in the system.

W:\Hitachi--60717300502 Apparatus for Curvature Modification\RFOA App for Laser Curvature.doc

Atty. Ref.:SJ0000019US2 (60717-300502)

Page 7 of 8

RECEIVED  
CENTRAL FAX CENTER

MAR 09 2007

"Keith et al. ('048) discloses forming rows of sliders which are partial cut following fabrication which allows easy inspection and packing, but allows for easy separation of the completed slider just prior to assembly.

5 "It would have been obvious to form multiple sliders as taught by Keith et al. ('048) in the Suenaga et al., Chiba et al. and Kerth et al. ('775) system because of the enhanced manufacturing efficiency."

10 Claim 29 is dependent on Claim 20, and includes by its dependence the assertedly non-obvious features of the present invention. Therefore, Applicant respectfully asserts that this claim is also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claim 29 be allowed.

15 *Response to Arguments*

Examiner has stated:

20 "Applicant's arguments filed 10/22/06 have been fully considered but they are not persuasive. Applicant argues that the combination of limitations; energy per pulse and repetition are not taught. The examiner respectfully notes that these limitations are taught by the Chiba et al. reference."

25 These parameters of energy, repetition and pulse width are specifically designed for the purpose of producing very high crown and camber in slider materials by creating controlled tensile stress in the flex side of the sliders using variable laser fluence to melt the slider material without over-heating the sensor in it and without tensile stress relief cracks of controlled or preferred orientation.

30 It required considerable experimentation to design the apparatus to produce appropriate fluence as determined by these energy pulse parameters, and one skilled in the art could not easily produce such an apparatus without much undue experimentation. The apparatus claimed is carefully configured to produce this combination of parameters for this specialized application.

W:\Hitachi--60717300502 Apparatus for Curvature Modification\RFOA App for Laser Curvature.doc

Atty. Ref.:SJ0000019US2 (60717-300502)

Page 8 of 8

RECEIVED  
CENTRAL FAX CENTER

MAR 09 2007

Thus it cannot be fairly said that the present invention is made obvious by the cited references, either alone or in combination.

Thus, applicant respectfully asserts that the present invention is not obvious in view of the cited references. Applicant respectfully requests that the rejection  
5 be withdrawn and Claim 20 be allowed, and dependent claims 21-29 be allowed.

**Conclusion:**

10 Applicant has endeavored to put this case into complete condition for allowance. It is thought that the current amendments have corrected the problem s with the Abstract. It is thought that the claims as currently amended cannot be fairly said to be obvious over the cited references. Applicant therefore respectfully asks that the objection and rejections be withdrawn and that allowance of all claims  
15 presently in the case now be granted.


If the Examiner would like to discuss any of the points involved in the Response, he is urged to contact Applicant's Attorney at the numbers included below.

20

IPLO  
1901 South Bascom Avenue, Suite 660  
Campbell, CA 95008

Telephone: 408 558-7887  
Facsimile: 408 558-9960  
E-mail: lguernsey@iplo.com  
LBG:lbg

Respectfully Submitted,

  
Larry B. Guernsey  
Reg. No. 40,008

W:\Hitachi--60717300502 Apparatus for Curvature Modification\RFOA App for Laser Curvature.doc